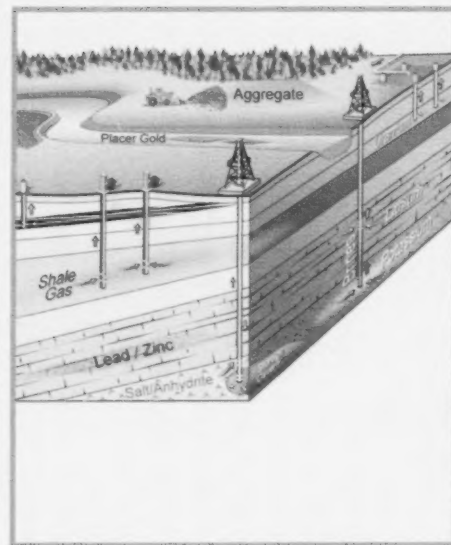
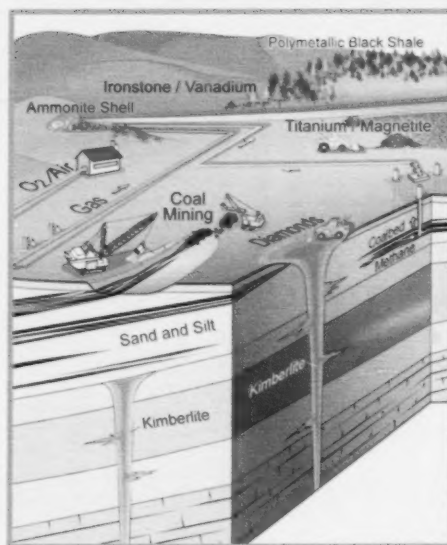
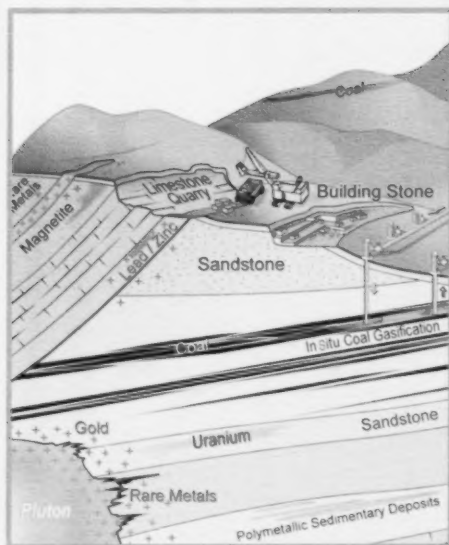


Coal and Mineral Development in Alberta

2011 Year in Review

Assessment Reports
Metallic and Industrial Mineral Activity
Coal Mining and Projects
Ammonite Shell
Alberta's Regulatory System



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Coal and Mineral Development in Alberta 2011 Year in Review

Introduction

Alberta Energy manages the development of the province's non-renewable resources, including coal, minerals, natural gas, petrochemicals, conventional oil and oil sands, and renewable energy (e.g. wind, bioenergy, solar, hydro and geothermal). The Department grants industry the right to explore for and develop energy and mineral resources; establishes, administers and monitors the effectiveness of fiscal and royalty systems; promotes energy efficiency and conservation, by both Albertans and industry; and encourages additional investment that creates jobs and economic prosperity.

This overview of Alberta's Coal and Mineral Development Branch (the first prepared by the business unit) is intended to provide a review of the coal, metallic and industrial mineral activity in Alberta during 2011. The review includes description of advanced or significant metal and industrial mineral exploration and mining activity, as well as brief descriptions of pilot projects designed to assess new uses for the provinces mineral and coal resources.

Although the coal and non-fuel mineral sectors are relatively modest, economically, when compared to the province's conventional oil, natural gas and oil sands industries, the coal and mineral sectors do play an important role in the province's economy by providing opportunities for diversification and necessary minerals used by hydrocarbon developers. For example, minerals are used as a feedstock to various industries: such as the petrochemical industry which uses salt, or oil

sand producers which use limestone as an aggregate for road construction. As well, several metals such as lithium and titanium minerals have the potential to become a value-added extraction from established activities in the oil and gas sectors.

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Updates

A change that will peripherally affect holders of Metallic and Industrial Mineral Permits is assessment reports are no longer being reviewed by the Alberta Geological Survey (AGS). The responsibility for the review and storage of the reports has been taken over by the Coal and Mineral Development Branch (CMD). Metallic and Industrial Mineral clients may have also noticed that assessment reports are no longer available on the AGS website, as was previously available. Because of Freedom of Information and

Protection of Privacy (FOIP) issues with the assessment reports, the digital copies have been removed from the Alberta Geological Survey's website. The Branch is actively working on fixing the FOIP concerns and making all previous, and future, reports available on the Alberta Energy website. Until they are available online, clients can contact CMD (see CMD contact info, page 4) to request access to an assessment report. If requested, a time will be arranged to come into the CMD office to view the report or a scan will be mailed on compact disc (CD).

Alberta's Regulatory System

The Crown owns 81% of the mineral rights in Alberta. The other 19% are *Freehold* mineral rights and are owned by individuals, companies or the federal government on behalf of First Nations. The Coal and Mineral Development Branch is responsible for the administration of the Crown's mineral rights for metallic and industrial minerals and coal.

Coal and Mineral Development issues a variety of agreements, depending on the specific substance and/or activity a client wishes to pursue. Each agreement type is defined and governed through the Alberta's *Mines and Minerals Act* (RSA 2000, M-17), the *Metallic and Industrial Minerals Tenure Regulation* (AR 145/2005) and the *Ammonite Shell Regulation* (AR 152/2004).

Permit

Metallic and Industrial Mineral (MIM) permits are issued for the exclusive right to explore for metallic and industrial minerals in the subsurface and remove samples for exploration purposes. No annual rent is payable on a permit; to keep a MIM permit, the holder must perform a specified monetary amount of exploration work every year on the lands. The permittee is required to submit an assessment report every two years outlining the dollar amount spent on exploration and the results obtained from those expenditures. Permits can be held for a maximum of 14 years.

Permits are not issued for coal in Alberta. A coal lease or lease application is sufficient for tenure rights while performing a coal exploration program. MIM permits are governed by the *Metallic and Industrial Minerals Tenure Regulation*.

Statistics for the number of permits and permitted area, for the previous five years, are provided in Figure 1.

The information contained within this report has been collected from publicly available government information, company websites, press releases, and reports filed on Sedar (www.sedar.com). All figures quoted are current as of the time of publication. Please consult the company websites for specific information regarding any projects outlined in this report. Any other references are noted within the document. The authors make no warranty of any kind with respect to the content and accept no liability, either incidental, consequential, financial or otherwise, arising from the use of this document.

Cover Photo Credit: Dan Magee, Energy Resources Conservation Board/Alberta Geological Survey

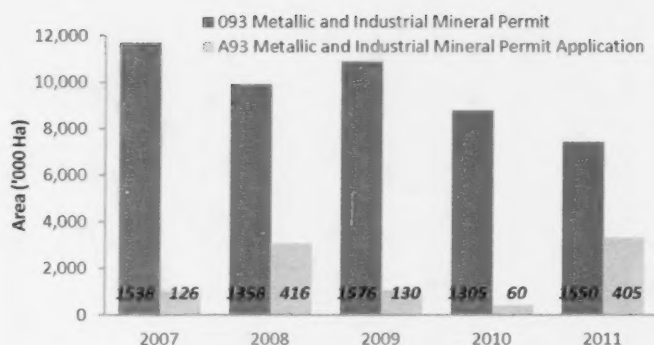


Figure 1. A bar graph with the total area of MIM Permits and Permit Applications for 2007 through 2011. Numbers at base of bars indicates number of individual permits.

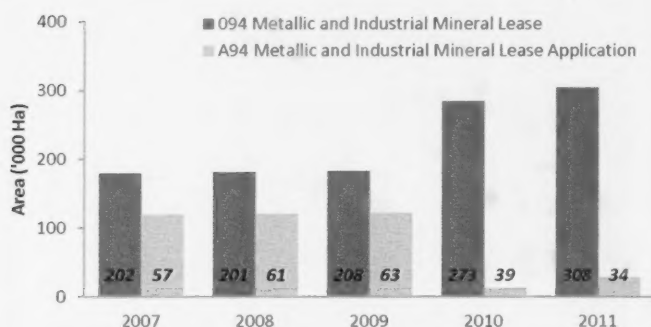


Figure 2. A bar graph with the total area of MIM Lease and Lease Applications for 2007 through 2011. Numbers at base of bars indicates number of individual leases.

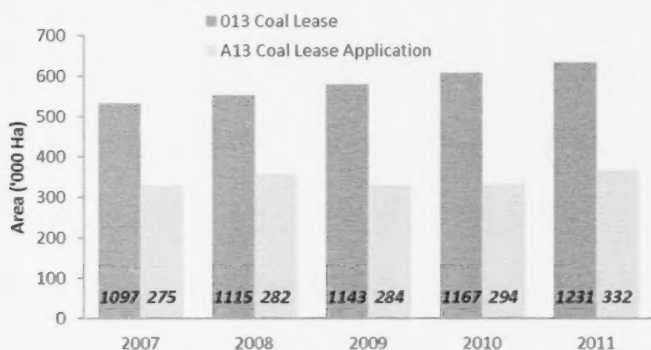


Figure 3. A bar graph with the total area of Coal Leases and Coal Lease Applications for 2007 through 2011. Numbers at the base of the bars indicates number of individual agreements.

Lease

Leases are issued for both MIM and Coal and convey the exclusive right to win, work and recover MIM or coal. To obtain a MIM lease, an applicant must hold a MIM permit for at least two years on any lands being applied for lease and satisfy the department there is minable resource at the location of the lease. All leases are issued only after referral to the Crown Mineral Disposition Review Committee (CMDRC) to ensure there are no environmental, land use or other such issues.

Leases are granted for a 15 year term and are renewable as long as the land is being worked. MIM leases are issued as per the *Metallic and Industrial Minerals Tenure Regulation*. Coal leases are issued under the *Mines and Minerals Act* and *A Coal and Mineral Development Policy for Alberta (1976)*. Annual rental of \$3.50 per hectare per year is charged annually for leases.

Statistics for the number of leases and leased area, for the previous five years, are provided in Figure 2 (MIM) and Figure 3 (coal).

Licence

Metallic and Industrial Mineral Licences are issued for the purpose of recreational placer mining. They convey the right to win, work and recover metallic and industrial minerals through placer mining. Each licence is valid for a 5 year term. A licence does not provide tenure rights or exclusive rights to any substance. Because it does not provide tenure rights, each placer mining operation can only stay in a spot for a total of fourteen days at which point it must be moved to a new location.

Statistics for the number of licences issued over the past five years are provided in Figure 4.

Ammonite Shell Agreement

Ammonite Shell Agreements give the exclusive right to recover ammonite shell. The holder of an agreement must also apply for an exemption from the Historical Resources Act because ammonite shell is a fossil and is, therefore, the property of the Crown. For an Ammonite Shell Agreement to remain valid, the Historical Resources Act exemption must be held for the duration of the agreement. Ammonite Shell Agreements are good for an initial 15 year term and renewable for further 5 year terms.

Statistics for the number and area of ammonite shell agreements, for the previous five years, are provided in Figure 5.

Special Mineral Lease

Special Mineral Leases are issued for underground storage caverns and other non-mining uses of Crown-owned minerals. They are issued through an Order in Council under the *Mines and Minerals Act*. Special Mineral Leases are issued for a 15 year, renewable, term; an annual rental, currently \$12.50 per hectare must be paid to maintain a special mineral lease.

Statistics for the number and area of special mineral leases, for the previous five years, are provided in Figure 6.

Secondary Mineral Lease

Secondary Mineral Leases grant the right to win, work and recover metallic and industrial minerals through a secondary recovery operation. A Secondary Mineral Lease is generally issued to the operator of a gravel pit that wishes to process the sand and gravel to extract gold and/or silver. It is for a term of 5 years and may be renewed for further 5 year terms if proper approval for a surface operation is renewed. At the end of 2011 there were only two Secondary Mineral Lease agreements.

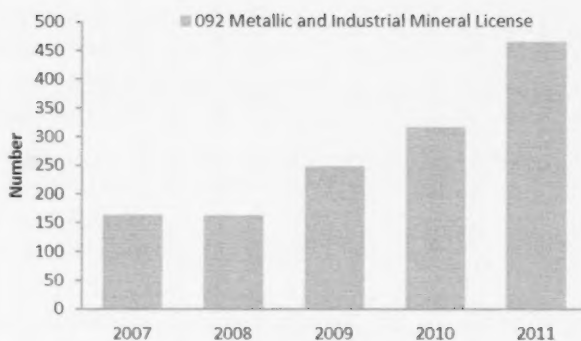


Figure 4. A bar graph with the total number of MIM Licenses for 2007 through 2011.

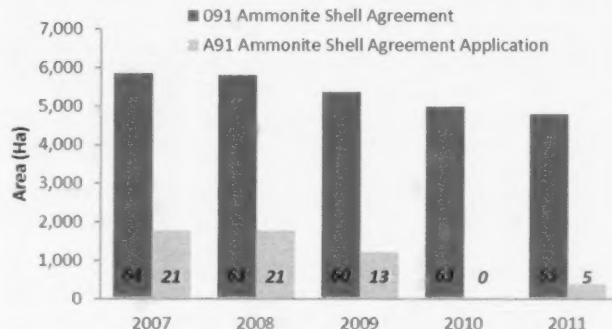


Figure 5. A bar graph with the total area of Ammonite Shell Agreements and Applications for 2007 through 2011. Numbers at base of bars indicates number of individual agreements.



Figure 6. A bar graph with the total area of Special Mineral Leases and Applications for 2007 through 2011. Numbers at base of bars indicates number of individual agreements.

Interactive Maps

The CMD branch is responsible for updating the information found on the interactive maps that are on the Alberta Energy website. There are three interactive maps available: coal, metallic and industrial minerals and ammonite shell, and can be found on the Alberta Energy website at www.energy.alberta.ca/OurBusiness/1072.asp. All of the maps are updated nightly and contain all tenure information for each corresponding mineral type. They are searchable and detailed reports can be generated for the land, description and contact information for each agreement and restriction.

2011 Metallic and Industrial Mineral Exploration Highlights

There was significant exploration work completed on Metallic and Industrial Mineral Permits in 2011. Commodities being explored for range from minable base metals to processing of byproducts from the petroleum industry for rare metals. A summary of reported exploration expenditures for the last five years is provided in Table 1. There has been a decrease in total spending from a peak of 2008. The reader should note that the values listed are only what are reported, as required by the regulations; actual expenditures are likely higher.

Year	Number of Assessments	Permits	Area (ha)	Permit Area with Expenditures (ha)	Accepted Expenditures	Payment in Lieu
2006	34	291	1,762,062	964,412	\$ 6,227,899	
2007	29	422	2,147,898	1,607,535	\$ 9,910,110	
2008	32	527	2,919,806	1,637,142	\$16,278,661	\$ 92,360
2009	21	430	2,625,110	704,873	\$ 8,254,883	
2010	23	261	1,705,058	510,046	\$ 5,759,328	
2011*	19	112	671,214	116,678	\$ 2,029,721	

Table 1. Total reported assessment expenditures from 2006 to 2010. For assessment purposes, permits are divided into seven two-year work periods, with \$5/hectare of expenditures for the first work period, \$10/hectare for work period 2 and 3 and \$15/hectare for the remaining is required. *Reported expenditures.

Base Metals

DNI Metals Incorporated (www.dnimetals.com) has released a NI 43-101¹ compliant 227 million tonne inferred resource on the Buckton Mineralized Zone of their Alberta Polymetallic Black Shale Project, located in the Athabasca Region approximately 120 km north of Ft. McMurray.

¹ National Instrument 43-101 is a guideline developed by the Canadian Securities Administration (CSA) that governs the disclosure of scientific and technical information about mineral projects to the public. They can be downloaded from the Canadian Institute of Mining website: www.cim.org/standards.

Further drilling results were released late in 2011 outlining the addition of intercepts of rare earth elements and specialty metals from analyzed drill core. These results are from within the Buckton zone and are expected to be included in the resource early in 2012.

The Poly-Metallic Black Shale is a tabular deposit, hosted in the upper Cretaceous Second White Speckled Shale formation. It hosts base metals of modest grades (10-100's ppm; see Table 2) but with large tonnage over a wide area.

There have been six mineralized zones, including the Buckton zone, recognized in an area of 2,720 km, with an overburden thickness of less than 75 m. DNI reports that as of 2011 drilling, the deposit remains open to the north and northeast and extends approximately 300 m to the east to the erosional edge of the Birch Mountains.

The deposit has been known since the mid-1990's but was considered uneconomical due to the inability to efficiently recover the metals. DNI Metals has been experimenting with Bio-Heap Leach technology which they believe provides the ability to extract the low-grade metals economically. They are modeling their approach after the Bio-Heap Leaching process currently being employed at the Talvivaara Mine in Finland.

Bio-heap leaching utilizes bio-organisms, along with air, CO₂ and water, sprayed onto the ore. The bio-organisms metabolize iron and sulphur resulting in sulphuric acid and metals. After passing through the ore, the metal rich fluids are processed to extract the metals.



Figure 7. An outcrop at DNI Metal's Alberta Polymetallic Black Shale property in northeast Alberta. Photo courtesy of DNI Metals Inc.

	MoO ₃	Ni	U ₃ O ₈	V ₂ O ₅	Zn	Cu	Co	Li ₂ CO ₃
Raw Grade (ppm)	115	148	37	1288	302	76	23	302
Recovery (%)	0.5	0.9	0.9	0.4	0.9	0.6	0.9	0.5
Recoverable Grade (ppm)	57	133	33	515	272	46	21	151
Metal/Oxide Price* (US\$/kg)	47.6	24.5	160.9	17.9	2.4	7.1	55.8	6.6
Recoverable Metal/Oxide ('000 kg)	12,998	30,143	7,490	116,847	61,718	10,356	4,723	34,249

Table 2. Results from bio-heap leach tests of DNI Metals' Alberta Polymetallic Black Shale Deposit. Data are from DNI Metals Inc.

Iron

Development of the Clear Hills iron ore project continued through 2011. Ironstone Resources Inc (www.ironstoneresources.com) completed a 144 diamond drill hole program on the North Whitemud Creek block of their Clear Hills project, with 12,077 metres drilled; over 3,000 metres of which were cored in ironstone. The average thickness intersected was 9.5 metres. Greater than 4,500 samples of core were collected and were to be analyzed and incorporated into a NI 43-101

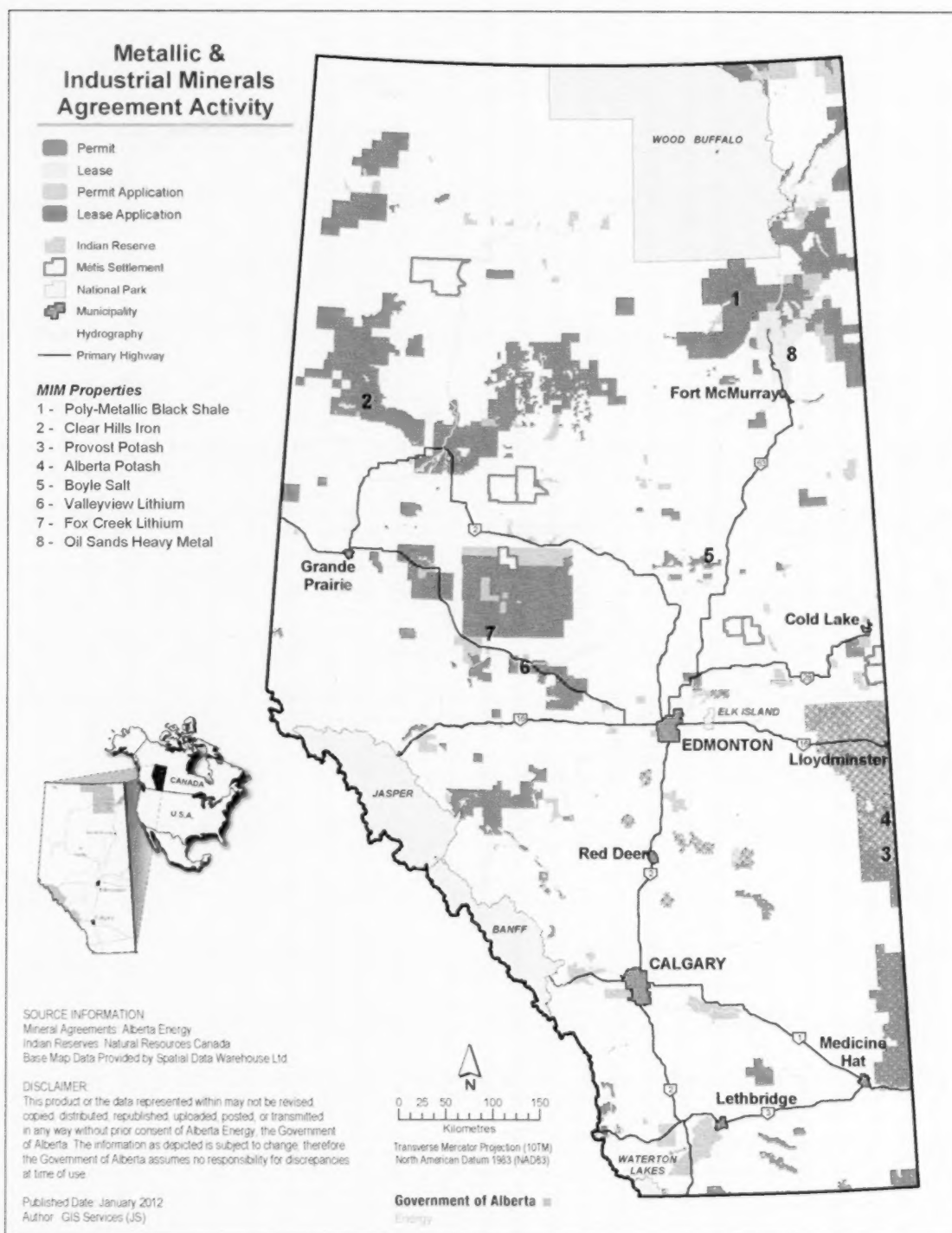


Figure 8. A map showing the Metallic and Industrial Mineral Agreement activity in Alberta. The data is current as of January, 2012.

Technical Report to be completed late in 2011. The intention is to add to the 203 million tonne indicated and inferred resource (see Table 3) previously published in an NI 43-101 Technical Report on the Rambling Creek Block.

In conjunction with the drill program, a 10,000 tonne bulk sample was extracted from the southern end of the Rambling Creek block. The ore is currently stockpiled on Ironstone's land near Hines Creek, AB. It is planned to use the stockpile for the development of processing methods in preparation for future mine development. Ironstone is also involved in development of a pilot plant for the ore processing. They are currently testing different processing methods to produce metallic iron.

	203 Mt	Tonnes	Fe (%)	SiO ₂ (%)	V ₂ O ₅ (%)
Indicated		139,677	33.04	27.47	0.21
Inferred		62,824	33.70	27.91	-

Table 3. A table showing the indicated and inferred resources from the Rambling Creek Block of Ironstone's Clear Hills property. The data are from Ironstone Resources Inc.

Diamonds

Although 2008 through 2010 saw significant exploration for diamonds within the Buffalo Head Hills kimberlite field, there was no significant activity reported in 2011.

Potash

Pacific Potash Corporation (www.pacificpotash.com) has drilled and logged, to an approximate depth of 1460 m, the first two exploration holes (11-29-037-01w4 and 10-29-38-1w4) on its Provost Potash property along the Alberta-Saskatchewan border, approximately 250 km southeast of Edmonton.

Exploration is targeting the Patience Lake member of the Devonian Prairie Evaporite formation that forms part of the upper Elk Point group. The potash-bearing interval is thought to be 3 to 6 metres thick at a depth of 1300 to 1450 metres. The potash content is estimated to be 15 to 25 percent K₂O, based on a gamma ray log from an old oil and gas well (4-18-038-01w4) drilled in 1994. The downhole geophysical log from the first drill hole on the property is reported to have produced a gamma ray signature consistent with the gamma ray log from the historic oil and gas well. The new exploration hole has identified the main potash zone at a depth of 1328 to 1331 metres, interpreted to be within the upper part of the Patience Lake member. Pacific Potash has also completed a high-resolution aeromagnetic-electromagnetic (VTEM) survey of the Provost Potash property.

Pacific Potash Corporation and Grizzly Discoveries Incorporated (www.grizzlydiamonds.com) have completed the first exploration hole (10-11-040-01w4) their jointly owned and operated 50:50 property, in conjunction with Pacific Potash Corp.

Grizzly Discoveries has also been busy working on its own property. It has continued to add land to its existing MIM permits and has collected seismic survey data to identify potential drill targets. A plan is also in place to drill exploration holes on each of the North and South blocks on their Alberta Potash property, with two holes started at the end of the year.

Softrock Minerals Limited (www.softrockminerals.com) received new MIM permits covering 204, 634 acres of land in southeastern Alberta. Softrock Minerals considers this land prospective for potash and are planning drilling for 2012.

Salt

Athabasca Minerals Incorporated (www.athabascaminerals.com) received a MIM Lease for salt on its Boyle Salt Project, near Boyle, Alberta. The salt may be used in the production of compounds such as caustic soda or sodium bicarbonate and the property is located near potential end users.

Once the salt has been extracted from the host unit, the cavern that has been created may be turned into a storage cavern. This is done with the issuance of a Special Mineral Lease for the zone in which the cavern is hosted.

Silica Sand

A 12,800 hectare lease was granted to Athabasca Minerals Limited for their Firebag Frac Sand project in the Wood Buffalo region in northern Alberta. Athabasca announced, in summer 2011, test results that meet or exceed API/ISO specifications for hydrofracturing and/or gravel packing operations. They have plans to initiate a project to complete a NI 43-101 technical report and pilot-scale production.

Lithium

First Lithium Resources Incorporated (www.firstlithiumresources.com) has increased its permits in the area of the Valleyview Lithium property. The decision to take on an extra 18,400 ha resulted from favourable analyses of brine from oil and gas wells on the new permit lands. Table 4 shows an example of the results.

First Lithium is the owner and operator of the Valleyview Lithium property, in which they hope to extract lithium (Li), among other elements, from formation waters of the Western Canada Sedimentary Basin. These formation waters are already extracted, processed for petroleum products and returned to the aquifer by oil and gas operators so the intention would be to process the waters for elements such as Li prior to pumping back into the aquifer. Lithium is currently being produced from formation waters in Nevada. The lithium content of Alberta brines in the Fox Creek area have been reported on in the mid-1990's, and seem to have comparable concentrations to these known lithium brine deposits².

Channel Resources Limited (www.channelresources.ca) reported it was moving ahead, on its Fox Creek property, with evaporation tests for extracting lithium and potash from brines and testing methods to recover boron (B) using solvent extraction. Results have not yet been released and are expected sometime in 2012, along with an updated NI 43-101 Technical Report for the property.

Heavy Metals

Titanium Corporation Incorporated (www.titaniumcorporation.com) has been progressing with their pilot project to recover heavy metals from oil sands tailings in the Ft. McMurray area. Early in 2011 they announced the completion of the second phase of their demonstration. The process diverts tailings material through Titanium's processing facilities prior to transferring them to tailings

	Concentration (mg/L)
Bromide	1,360
Dissolved Calcium	17,300
Dissolved Potassium	6,390
Dissolved Sodium	60,300
Total Boron	329
Total Lithium	89
Total Magnesium	1,760

Table 4. A table listing favourable concentrations of various elements from oilfield brines. The data are from First Lithium Resources.

² Hitchon, B., Bachu, S., Underschlutz, J.R. and Yuan, L.P. (1995). Industrial mineral potential of Alberta formation waters. Alberta Geological Survey, Bulletin 62, 69p.

ponds for disposal. The main product they are aiming to extract is zircon, along with titanium (Ti)-minerals, such as rutile and ilmenite.

The pilot project has been partially funded, with up to \$5 million, by the Federal Government, through Sustainable Development Technology Canada (SDTC), and \$3.5 million from the Government of Alberta.

Metallic and Industrial Mineral Royalties³

Metallic	Pre-Payout:	1% mmr ^a
	Post-Payout: greater of	1% mmr or 12 % nr ^b
Placer	5% of value after the first troy ounce	
Quarriable	Bentonite:	\$0.11/t
	Other clay, marl, volcanic ash:	\$0.131/m ³
	Pottery clay, fireclay:	\$0.0655/ m ³
	Limestone, shale, granite, slate, gypsum, building stone:	\$0.0441/t
	Silica sand:	\$0.37/t
Salt	Dry salt, solute salt	\$0.45/t

^ammr: mine mouth revenue

^bnr: net revenue

Titanium-minerals are a feedstock to the TiO₂ pigment industry, which accounts for 90% of the world's consumption of Ti. Zircon is predominantly used in the production of ceramics. Demand for zircon, at 1.3 million tonnes per year⁴, currently outpaces the supply.

Uranium

There has been recent uranium exploration activity in the northeast corner of Alberta, near Lake Athabasca, but no significant reported activity for 2011. Uranium mineralization is known in the area and is an extension of the uranium rich Athabasca Basin in northwest Saskatchewan.

Mine Activities – Metallic and Industrial Minerals (MIM)

Production and royalty statistics for metallic and industrial minerals for 2011 are shown in Table 5. Quarriable minerals continue to account for the majority of MIM activity in the province. Limestone is the dominant quarriable mineral, with much of it used as aggregate for oil sands developments or in the production of cement.

Aside from placer gold, there are no metallic mines operating in Alberta. There are several prospects under investigation or development, but to date none have reached an operational stage.

Operating mines and quarries are listed in Table 7. The number of MIM Leases increased substantially, as did the total leased area, in 2010 and 2011 (Figure 2). There has been a subsequent decrease in lease applications, as

	Production	Royalty
Quarriable Minerals	7,980,265 t	\$ 363,672
Salt	239,061 t	\$ 107,577
Gold	2,182 tr oz	\$ 149,805

Table 5. A table of production and royalties from metallic and industrial minerals from October 1, 2010 through September 30, 2011. Quarriable minerals include dolomitic siltstone, limestone, sandstone, shale and silica sand.
t=tonnes; tr oz=troy ounces.

³ Metallic and Industrial Minerals Royalty Regulation. Alberta Regulation 350/1993.

⁴ www.roskill.com/reports/industrial-minerals/zirconium

the previously outstanding lease applications were approved for lease. However, it indicates that there has been a decreased interest in new leases in the last year.

Placer Gold

MIM Licences for recreational placer mining have increased substantially over the last five years (Figure 4). The reason for the increase in interest is unclear. However, one could speculate the increase in gold price has made recreational mining more lucrative.

Coal Mines

Coal has been a very active commodity for Alberta in 2011. The global demands for metallurgical (coking) coal is on the upswing and international companies are starting turn their attention to Alberta's bituminous coal as part of the supply. There has been a steady increase in the area, and number, of coal leases and coal lease applications in Alberta, from 2007 through 2011 (Figure 3).

One of the more notable transactions for 2011 was the \$1 billion purchase of Grande Cache Coal Corporation to Winsway Coking Coal Limited of Hong Kong and Japanese Marubeni Corporation. Several companies have submitted applications for coal leases within the mountain and foothills regions of the province.

Alberta currently has two operating metallurgical export coal mines: Cardinal River and Grande Cache Coal (see Table 7 for more information regarding ownership and Figure 9 for the location). The two other bituminous mines (Coal Valley and Obed Mountain) are currently exporting their product as high quality thermal coal.

The remainder of the coal mining in Alberta is producing sub-bituminous coal for domestic use, predominantly for electricity generation. There are currently seven sub-bituminous coal mines operating in Alberta, all of which are within the Plains region (Figure 9).

Advanced Coal Projects

The largest coal development project in Alberta currently is the Vista Project, owned and operated by

Coalspur Mines Limited (www.coalspur.com). The project is at an advanced stage of exploration, having completed a pre-feasibility study early in 2011. Given the current coal reserves, the Vista Project has the potential to become one of the largest dedicated thermal coal export mines in North America.

Located near Hinton, Alberta (see Figure 10), the Vista Project sits on the eastern margin of the outer foothills. It is hosted in the upper Cretaceous-Tertiary Coalspur and Paskapoo formations and consists of several gently dipping coal seams. One of the major benefits of the Vista coal for thermal use is its low sulphur content.

	Recoverable Coal Reserves (Mt)		Marketable Coal Reserves (Mt)	
	Proven	Probable	Proven	Probable
Export Product	349.2	79.5	185.9	42.7
Domestic Product	66.2	26.8	22.5	8.9

Table 6. JORC⁵/NI 43-101 Coal Reserves for the Coalspur's Vista project. The data is from a Coalspur press release.

⁵ Australasian Joint Ore Reserves Committee. JORC produces the Code for Reporting of Mineral Resources and Ore Reserves (JORC Code), which is an Australian standard for professional reporting purposes.

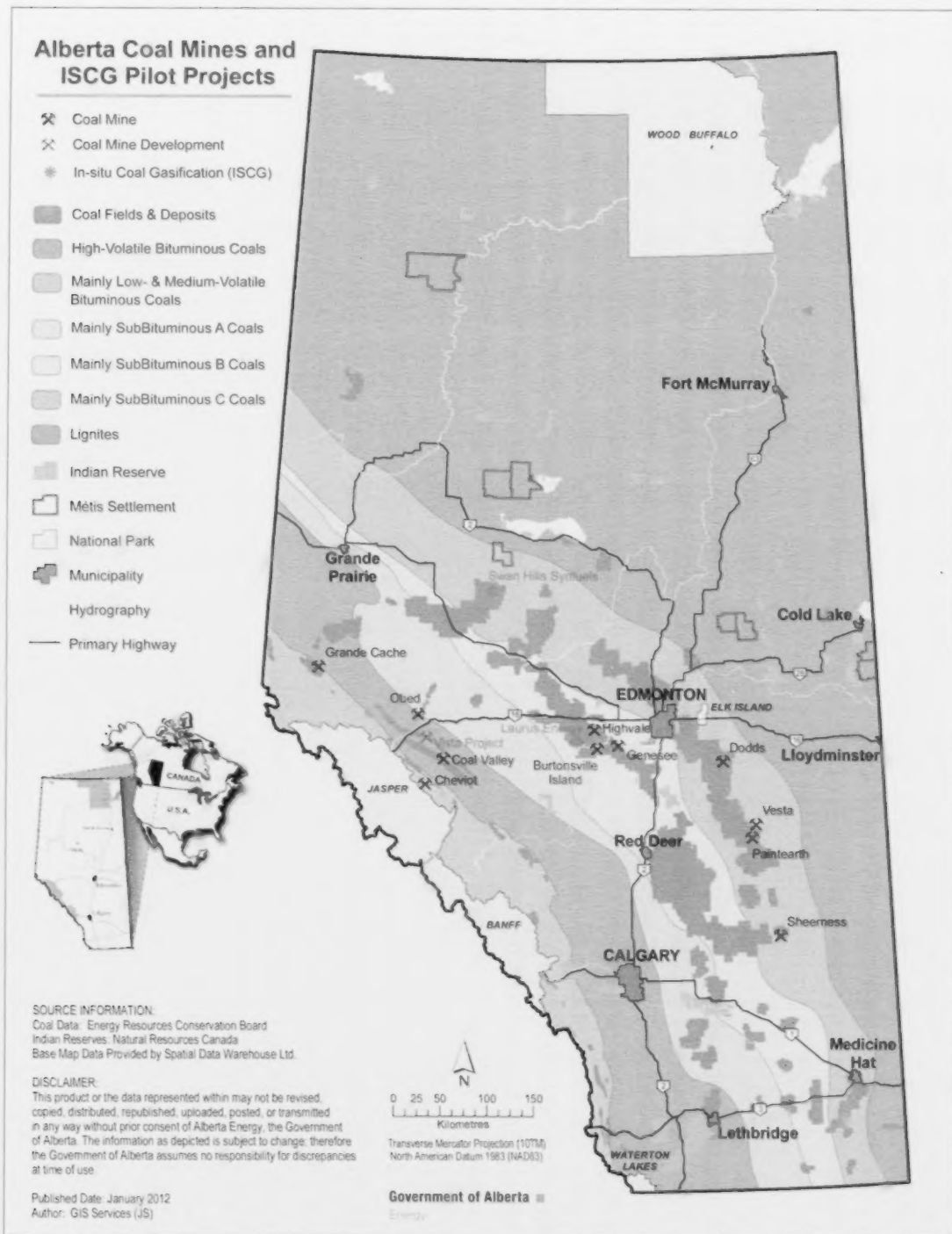


Figure 9. A map showing the location of Alberta coal mines, advanced coal mine projects and in situ coal gasification projects. Also plotted is the extent of Alberta's coal fields and approximate distribution of coal grades across the province.

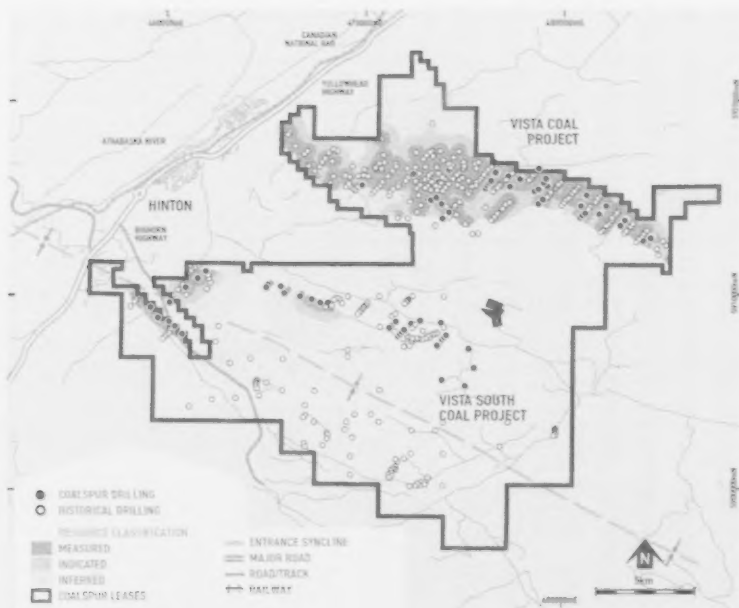


Figure 10. A map showing the lease area, drill locations and area of calculated coal resource for Coalspur's Vista and Vista South projects. Courtesy: Coalspur Mines Ltd.

Coalspur has been busy with development of the project in 2011. Drilling and bulk sampling began early in the year along with an environmental field program. They have started with the regulatory process for the mine development as well public consultations, both of which are slated to continue into 2012. There is also work planned for a full feasibility study to add to the pre-feasibility study that has already been completed. As of the end of 2011, the mine development permit and processing plant approvals have been granted by the ERCB. An important step to export is a 14 year agreement, between Coalspur and Ridley Terminals in Prince Rupert, BC, for up to 8.5 million

tonnes per year. The port agreement as well as capacity available with CN Rail allows for access to seaside markets which are integral to getting coal to Asian markets.

In Situ Coal Gasification (ISCG)

Swan Hills Synfuels (www.swanhills-synfuels.com) has been busy in 2011 with their ISCG pilot project in the Swan Hills area. The total estimated cost of the project is \$1.5 billion. This includes development of the ISCG process, carbon capture and storage system and power generation station. The Government of Alberta announced a \$285 million contribution to the pilot project, in July, 2011.

Laurus Energy Incorporated (www.laurusenergy.com) has also obtained leases with the intention of developing an ISCG project in the Drayton Valley area of Alberta. The Energy Resource Conservation Board has approved its application for development. The proposed coal horizon targeted by Laurus Energy is shallower than that being tested by Swan Hills Synfuels.

ISCG is the creation of synthetic gas (syngas) from underground coal seams (Figure 11). Swan Hills is currently targeting coal within the Manville group at a depth of approximately 1400 m. To produce the syngas an injection well delivers oxidants (oxygen, O_2 , and steam) into the coal seam, which fuels combustion (700 to 900 °C) of the coal. The raw syngas, consisting mainly of carbon dioxide (CO_2), hydrogen (H) carbon monoxide (CO) and methane (CH_4), is collected by a separate extraction well and processed at surface to remove the CO_2 and produce clean syngas. The syngas can then be burned in a generation plant to produce electricity.

Because ISCG can target deep coal, a proven gasification technology would drastically increase Alberta's minable coal reserves. These deep coals, like those in the Mannville group, cannot be economically extracted, because of their depth, so are not considered as a minable reserve. Conversion of these coals to syngas has the potential of becoming an important resource for Alberta and a major source of fuel, for a future alternative to coal power generation. The hydrogen produced during gasification of coal will act as an important local feedstock to the oil sands industry, which relies on large amounts of hydrogen during upgrading.

Alberta has received numerous inquiries regarding ISCG opportunities; from both Canadian and international companies. This follows the same pattern as for traditional coal, furthering the implication that coal is seeing a gain in interest worldwide. As ISCG-technology develops, Alberta's deep coal reserves, which are currently not economical to extract, will become increasingly more prospective as an energy source.

Coal Royalties in Alberta⁶

There are two royalty regimes for coal in Alberta. The two systems are divided regionally, which effectively divides them by coal grade, i.e., sub-bituminous or bituminous coal. Royalties are only collected on Crown-owned coal; if a mine is producing both Crown and freehold coal, they only pay royalties for the coal mined from within Crown leases.

Coal from within the Plains region (sub-bituminous coal) has a flat-rate royalty that is adjusted using a Crown Royalty Adjustment Factor (CRAF), which is set each year. The CRAF for 2012 has been kept the same as for 2011, keeping the royalty on sub-bituminous coal at \$0.55/tonne.

Mountain and foothills coal (bituminous coal) has a two stage system for royalties. Before a mine has paid off the capital expenses for mine development and construction, the royalty is 1% of the mine mouth revenue. After a mine has reached payout, they must pay royalties of 1% of mine mouth revenue and 13% of net revenue.

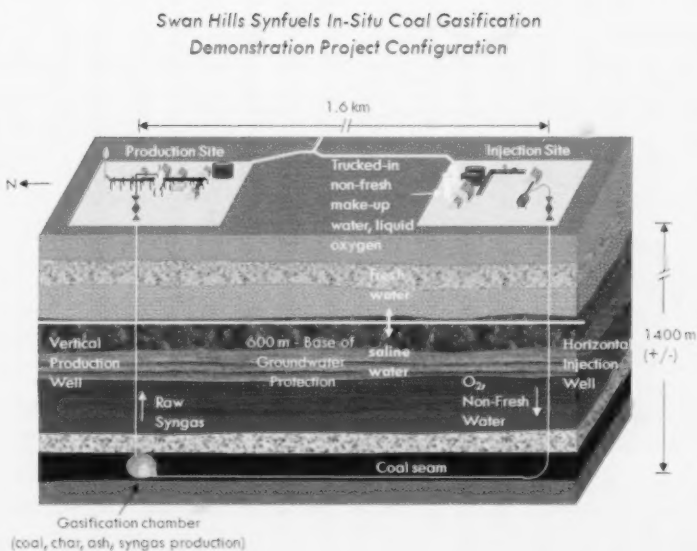


Figure 11. A schematic diagram of the in-situ coal gasification process. Source: Swan Hills Syntuels.

⁶ Coal Royalty Regulation. Alberta Regulation 295/1992.

Mine/Quarry	Commodity	Location	Operator
Burtonsville Island	Coal - Subbituminous	Burtonsville	Keephills Aggregate Company Inc.
Calling Lake	Salt	North of Athabasca	Calcium Inc.
Cardinal River	Coal - Bituminous	Hinton	Teck Coal Ltd.
Coal Valley	Coal - Bituminous	Edson	Coal Valley Resources Ltd.
Cougar Ridge	Limestone	Rocky Mountain House	Prairie Creek Quarries Ltd.
Exshaw	Limestone	Exshaw	Lafarge Canada Ltd.
Fish Creek	Limestone	Nordegg	Graymont Western Canada Inc.
Ft McMurray West	Limestone	Ft McMurray	Suncor Energy Inc.
Gap	Limestone	Exshaw	Graymont Western Canada Inc.
Genesee	Coal - Subbituminous	Warburg	Prairie Mines and Royalty Ltd.
Grande Cache	Coal - Bituminous	Grande Cache	Grand Cache Coal Corporation
Highvale	Coal - Subbituminous	Seba Beach	Transalta Generation Partnership
Lucky Strike	Coal - Subbituminous	Milk River	Tecologic International Ltd.
McLeod	Limestone	Cadomin	Lehigh Hanson Materials Ltd.
Mitsue	Salt	Slave Lake	Tiger Calcium Services Inc.
Muskeg	Limestone	North of Ft McMurray	Hammerstone Corporation
Obed Mountain	Coal - Bituminous	North of Hinton	Coal Valley Resources Ltd.
Onoway	Gold	Onoway	Lafarge Canada Ltd.
Paintearth	Coal - Subbituminous	Forestburg	Alberta Power (2000) Ltd.
Peace River Silica	Silica Sand	Peace River	Contractors Leasing Corp.
Riverview	Salt	Riverview	The Canadian Salt Company Ltd.
Rundle Stone	Dolomitic Siltstone	Canmore	Kamenka Quarries Ltd.
Seebe	Shale	Kananaskis	Lafarge Canada Ltd.
Sheepcreek	Sandstone	Grande Cache	Grand Cache Coal Corporation
Sheerness	Coal - Subbituminous	Hanna	Alberta Power (2000) Ltd.
Spencer	Gold	Villeneuve	Murox Industries Ltd.
Spencer 2	Gold	Villeneuve	Murox Industries Ltd.
Sprayfalls	Sandstone	Exshaw	Thunderstone Quarries Ltd.
Steepbank	Limestone	North of Ft McMurray	Hammerstone Corporation
Summit Lake	Limestone	Coleman	Graymont Western Canada Inc.
Vesta	Coal - Subbituminous	Cordell	Alberta Power (2000) Ltd.
Villeneuve	Gold	Villeneuve	Lehigh Hanson Materials Ltd.
Villeneuve 2	Gold	Villeneuve	Lafarge Canada Ltd.
Yamnuska	Sandstone	Kananaskis	Lafarge Canada Ltd.

Table 7. A table of active mines, mined commodity, location and operator listed. Listed mines have reported production through September 30, 2011; non-producing mines are excluded from the list.

Mine Activities - Coal

There has not been a significant change in production of coal for the 2011 year; total coal production and royalties collected are listed in Table 8. The royalties collected for bituminous coal are a mixture of pre- and post-payback rates, as not all of the foothills/mountain mines have reached payback status.

The sale of Grande Cache Coal Corporation (GCCC; www.gccoal.com) to Winsway Coking Coal Ltd of Hong Kong and Japanese Marubeni Corporation has been an important development within Alberta's coal mining community. Although GCCC will be under different ownership, they will continue to operate under the same name.

Coal Valley Resources Incorporated (www.sherritt.com) has been working on an Environmental Impact Assessment (EIA) for expansion of their Coal Valley mine. Coal Valley is currently developing the Robb Trend, which is located to the east of its current operations.

	Production	Royalty
Sub-Bituminous Coal	21,966,481 t	\$ 6,550,277
Bituminous Coal	6,898,123 t	\$ 24,966,481

Table 8. A table of coal production and royalties paid for sub-bituminous and bituminous coal in Alberta. Data are from October 1, 2010 through September 30, 2011. t=tonnes.

Transportation of Coal Exports

An important part of development of a coal mine for export coal, thermal or metallurgical, is the ability to get the product to market. Rail and ports access are integral steps to access international customers. Teck Resource Limited (www.teck.com) has announced agreements, in 2011, for terminal space with Westshore Terminals and Ridley Terminals, on the west coast of BC. Coalspur has also announced an agreement for port capacity with Ridley Terminals.

Ammonite Shell

Ammonite shell is the fossilized shell of *Placenticerus meeki* and *Placenticerus intercalary*. The gem variety, ammolite, is the target for ammonite shell mining in Alberta; it has a red-green iridescence that is widely sought for use in jewellery. They are mined from upper Cretaceous marine shales of the Bearpaw formation, mainly along the St. Mary River west of Magrath. This seems to be the only region in the world where shells reaching gem quality are found. Korite International Limited (www.korite.com) continues to be the largest producer of ammolite in world, accounting for approximately 90% of the world's supply.

Less than 10% of the ammonite shell found are of gem quality and considered ammolite. Of those, only 20% of the ammolite can be made into jewellery. As there is such a small quantity of ammolite produced every year, there is currently no royalty charged for ammolite collected from ammonite shell agreements.

Conclusion

Coal and Mineral Development in Alberta, 2011 Year in Review is a brief overview of the recent activity in Alberta's Metallic & Industrial Minerals and Coal sectors. It is intended to be the first in a series of annual updates for Alberta's Coal and Mineral Development Branch that will follow the development of the province's solid mineral resources. For more information please contact Alberta Energy, Coal and Mineral Development Branch at 780-427-7707 or CMD.Energy@gov.ab.ca.

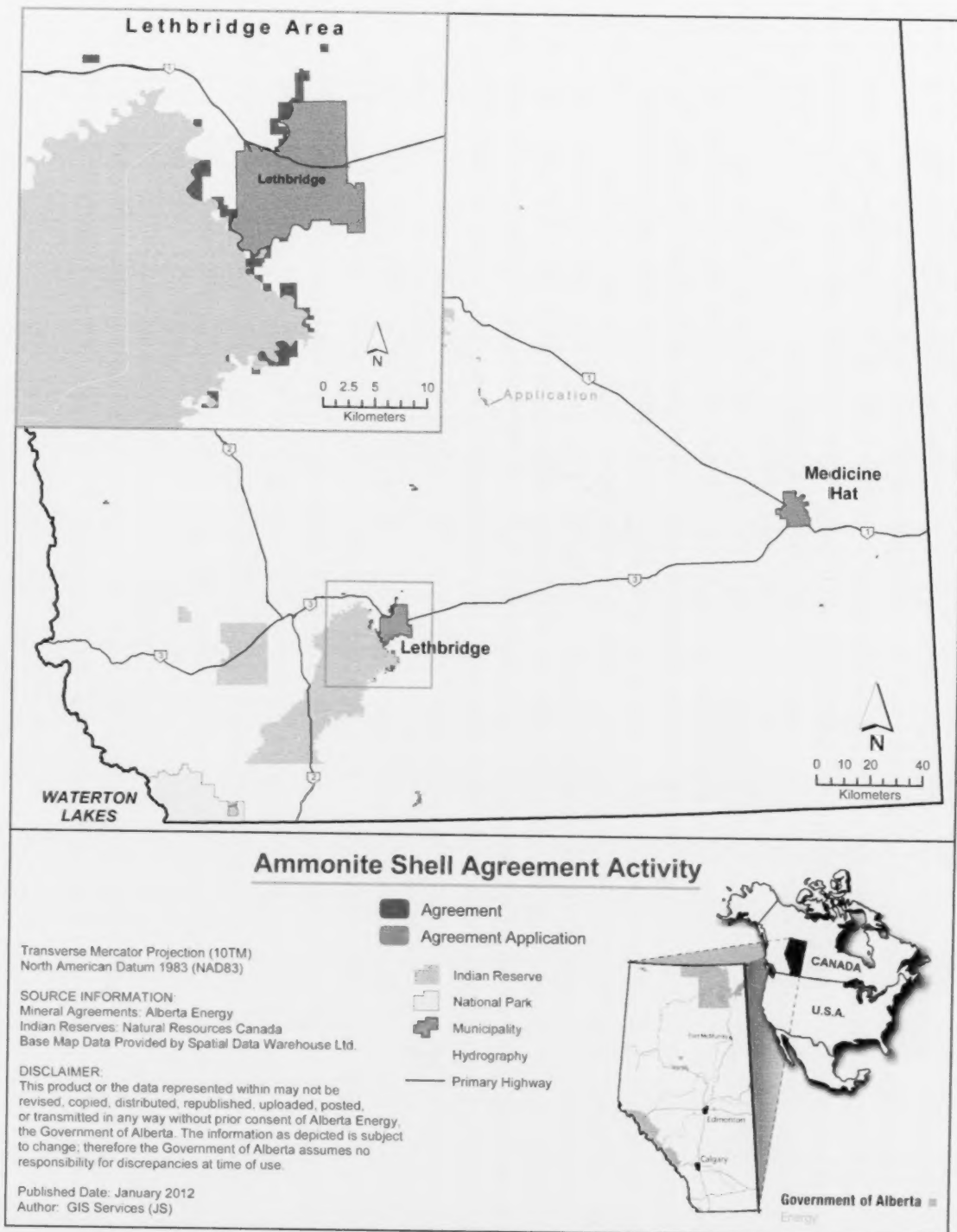


Figure 12. A map showing the locations of ammonite shell agreements in Alberta.

Legislation

Ammonite Shell Agreements, Coal and Metallic and Industrial Minerals are governed by a numerous Alberta Acts and Regulations. All of the following legislation is available for viewing or download from the Albert Queen's Printer (www.qp.alberta.ca).

Key Alberta Energy Acts and Regulations

- Ammonite Shell Regulation*
- Coal Royalty Regulation*
- Mines and Minerals Act*
- Mines and Minerals Administrative Regulation*
- Metallic and Industrial Minerals Tenure Regulation*
- Metallic and Industrial Minerals Royalty regulation*

Other Relevant Legislation

- Environmental Protection and Enhancement Act*
- Environmental Assessment (mandatory and Exempted Activities) Regulation*
- Environmental Assessment Regulation*
- Forest and Prairie Protection Act*
- Forests Act*
- Historical Resources Act*
- Law of Property Act*
- Municipal Government Act*
- Occupational Health and Safety Act*
- Public Highways Act*
- Public Lands Act*
- Metallic and Industrial Minerals Exploration Regulation*
- Special Areas Act*
- Surface Rights Act*
- Water Act*